PB-229 764

POLLUTION OF BACK RIVER

Public Health Service
Charlottesville, Virginia

January 1964

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

TD425
Back R.
P6

PB 229 764

SUMMARY REPORT

POLLUTION OF BACK RIVER

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

U.S.DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Region III
Public Health Service
Division of Water Supply and Pollution Control
Chesapeake Bay-Susquehanna River Basins Project
Charlottesville, Virginia

January 1964

INTRODUCTION

At the request of Congressman Clarence D. Long by letter to the Secretary of Health, Education, and Welfare on October 24, 1963, the Public Health Service has conducted a special study of pollution problems in the Back River Basin in Baltimore City and Baltimore County, Maryland. This summary report was prepared in cooperation with State and local agencies to present and evaluate all available information relating to the water quality conditions of Back River.

Agencies cooperating in and providing information for this special study are:

Baltimore City Department of Health

Baltimore City Department of Public Works

Baltimore County Department of Health

Baltimore County Department of Public Works

Maryland State Department of Health

Maryland Water Pollution Control Commission

Maryland State Planning Department

Chesapeake Bay Institute, The Johns Hopkins University

SUMMARY

Back River is a shallow tidal estuary of the Chesapeake Bay in Baltimore County, Maryland. Tributaries to Back River are several small creeks which flow through heavily populated areas of metropolitan Baltimore. Proximity of the Basin to this major metropolitan area has resulted in its development as a residential and important recreational area. Primary recreational use of the area includes boating, fishing, and aesthetic enjoyment.

Several significant waste-water discharges are located within the Basin; these include discharges from Baltimore City's Back River Sewage Treatment Plant, several industries, marine craft, occasional overflows from sewage pumping stations, and sewage from hundreds of private disposal systems.

The effects of these waste-water discharges upon the water quality of Back River are evidenced by the current restrictions on swimming. In addition, there are associated nuisance conditions which further detract from water-oriented recreational uses of the area. Topographic and economic considerations have presented serious obstacles to effective control of waste discharges in the Basin; however, problems of the area have been recognized by many individuals, agencies, and officials, as is evidenced by continuing programs of sewer extensions and expansion of treatment facilities. Sampling programs of regulatory agencies and related water user groups have provided a vital part of the pollution control program in the Basin.

CONCLUSIONS

Evaluation of existing pollution sources and analysis of bacteriological data indicates that Back River is potentially unsafe for bodily contact upstream from Lynch Point. Early improvement of water quality in this area will be exceedingly difficult because of the problems involved in controlling and/or eliminating overflows from hundreds of septic tanks, periodic overflows from several sewage pumping stations, drainage from refuse dumps, and waste discharge from marine craft. No one source of pollution may be implicated as the major contributor to poor water quality primarily because of the present lack of information on water movement within the estuary. Control of waste discharges would effect improvement of the water quality in the Basin. Several benefits may be realized from this improved water quality. These are enhanced recreational use and aesthetic conditions, relief of pollution-caused nuisance conditions, and a probable increase in property values.

In any pollution control program, the effects of surface water drainage from densely populated areas, plus the possibility of failure of waste-water transport and treatment systems, must be recognized.

After control of pollution sources, water quality in the River could possibly be improved to a degree that use of the waters for swimming and other bodily contact activities may be possible in

certain limited areas. Delineation of areas where bodily contact may be permitted would be made after analyzing the data on water movement and bacteriological quality in the estuary.

An effective water quality program to alleviate or control present and future pollution of Back River must be based upon comprehensive watershed planning. In developing such a program, consideration should be given to the following methods for preventing development of additional pollution sources.

1. Adopt more adequate controls regulating the discharges of wastes from marine craft.

2. Provide more rigid control of solid wastes disposal areas and prohibit unregulated dumping of refuse in the area.

3. Develop land-use regulations to control housing developments in areas with no public sewerage.

The complex nature of the problem requires that additional studies be undertaken before finalizing a Basin water quality control program. In planning and guiding specific studies in the area, the formation of a committee representing State and local governmental agencies could be most effective. Examples of studies that could be instituted are listed below.

1. Determination of water movement and circulation in the estuary by dyes or other methods.

2. Locate and identify various sources of surface drainage pollution and measure volumes and periods of sewage pumping station overflow.

3. Establish a network to monitor the streams and the estuary under various hydrologic conditions. This is especially useful in detecting unusual amounts or new contributions of pollution.

4. Review laws and regulations governing formulation of sanitary districts and/or a Back River commission. This review should also investigate the effects of these laws and regulations on administration and financing of pollution control programs and facilities.

Information from these studies is necessary in programing further remedial actions to improve water quality in the Back River Basin.

TABLE OF CONTENTS

		Page
	INTRODUCTION	i
	SUMMARY	ii
	CONCLUSIONS	iii
I	PHYSICAL DESCRIPTION	1
II	WATER USES	3
III	SOURCES OF WASTES	4
	Public Sewerage Facilities	4
	Individual Sewage Disposal Systems	6
	Marinas and Marine Craft	7
	Waste-Water	8
IV	EFFECTS OF WASTES ON WATER QUALITY AND WATER USE	10
	Studies by Baltimore County Department of Health	10
	Studies by the Baltimore City Department of Public Works	11
	Studies by the Maryland Water Pollution Control Commission	12
	Studies by Eastern Stainless Steel Company	13
V	REGULATORY AND CO-OPERATING AGENCIES IN WATER QUALITY CONTROL	14
	State Board of Health and Mental Hygiene	14
	Water Pollution Control Commission	14
	Baltimore County Board of Health	15
	Baltimore County Department of Public Works	15
	Baltimore City Department of Health	15

Page

Baltimore City Department of Public Works 16

Maryland State Planning Department 16

Chesapeake Bay Institute, The Johns Hopkins University 16

VI BIBLIOGRAPHY 17

VII APPENDICES 19

Appendix I - Sewage Pumping Stations in the Back River Basin 19

Appendix II - Maryland State Board of Health Regulations on Discharge of Domestic Sewage in a Watercourse 20

Appendix III - Industries Discharging Waste Water Directly to Back River Basin 21

Appendix IV - Bacteriological and pH Study of Back River by the Baltimore County Department of Health - July 19, 1963 22

Appendix V - Regulations Governing Public Swimming Pools and Bathing Beaches 24

Appendix VI - Analysis of Back River and Chesapeake Bay Waters by Baltimore City Department of Public Works - August 22, 1963 25

Appendix VII - Analyses of Shoreline Waters of Back River in the Vicinity of Back River Sewage Treatment Plant, Baltimore City Department of Public Works - September 18, 1963 26

Appendix VIII - Bacteriological Analyses of Back River, Chesapeake Bay, and Back River Sewage Treatment Plant Effluent, Baltimore City Department of Public Works 27

Appendix IX - Stream Sampling for Baltimore City Department of Public Works for Herring Run and Moores Run 32

Appendix X - Observation of Water Pollution Contents in the Back River Drainage Basin 33

Page

Appendix XI - Survey of Bacon Creek by Eastern Stainless Steel Company, November 5, 1963 36

Appendix XII - Regulations IV, Treatment and Disposal of Industrial Wastes, of the Maryland Water Pollution Control Commission 37

PHYSICAL DESCRIPTION

Back River is a tidal estuary of the Chesapeake Bay in Baltimore County, Maryland. The River is 9.2 miles long[1] and drains an area of 62.4 square miles; the drainage area above the head of the estuary is 26.8 square miles. Width of the estuary averages about three-fourths of a mile extending to about a mile and a half near the mouth. At mean low water, depths along the center line of the estuary range from two feet at the headwaters to 31 feet near the mouth, averaging about five feet in the upper half of the estuary and nine feet in the lower half.[3] Tides in the estuary average about 1.2 feet but may rise up to eight feet with strong winds from the northeast. The volume of the estuary is about one billion cubic feet, and the water is exchanged with the Chesapeake Bay at a rate of approximately 100 million cubic feet per day.[4] By comparison, the fresh water run-off to the estuary is about two million cubic feet or more per day 95 per cent of the time.[a] This surface run-off carries large quantities of silt which are deposited in the estuary, especially in the upper reaches. Estuary salinity ranges from an average of about 1.0 part per thousand during spring run-off to about 5.0 parts per thousand during the dry part of the summer.[b]

---

a/ Estimated by comparing to the Little Gunpowder Falls in the same vicinity, i.e., 0.36 cubic feet per second per square mile.[5]

b/ The salinity of seawater is about 35 parts per thousand.

The tributaries of Back River are several small creeks which are formed at elevations between 100 and 200 feet and flow through heavily populated sections of eastern Baltimore City and Baltimore County. Soil throughout the basin consists largely of tight gray clay with sand occurring sporadically. Standard water seepage tests average over 40 minutes per inch in the clay and range from one to 14 minutes per inch in the sand, depending on clay content. Significant physical characteristics of the basin are shown in Figure 1.

WATER USES

Principal water uses in the Back River Basin include boating, fishing, aesthetic enjoyment, plus waste-water assimilation and transport. The Back River area has developed as a residential and a major recreational area because of its proximity to metropolitan Baltimore. Much of the estuary shore is lined with residences or summer cottages. In addition to permanent residents of the area, several thousand persons utilize the Back River Neck (NE shore) during the summers. Boating is very popular in the Back River area, as a total of 837 craft with motors of 7 1/2 horsepower or more were registered in 1963.[6] These craft were harbored at five marinas and many private docks scattered along the shoreline.

SOURCES OF WASTES

Public Sewerage Facilities

The portion of the Back River drainage area located within Baltimore City is essentially completely sewered, as is the portion in Baltimore County to the north of the City. Public sewerage facilities in the areas immediately surrounding the estuary are scattered but serve the important areas of Essex and Middle River to the northeast of Back River, Edgemere to the southwest, and parts of Rosedale and Colgate to the northwest. A portion of the Fullerton area to the northwest is also sewered. All sewage from these areas flows to Baltimore City's Back River Sewage Treatment Plant, by gravity from the extreme northern and western portions of the drainage area and by means of pumps from other areas. Sewered areas, areas where sewers are under construction or design, and pumping stations are shown in Figure 1, with pumping stations listed in Appendix I. The estimated population of the sewered area in the basin was about 105,700 in Baltimore County and 175,400 in Baltimore City at the time of the 1960 census.

Baltimore City's Back River Sewage Treatment Plant is located 7.0 miles upstream from the mouth of the River and serves an estimated 1.17 million persons plus several hundred commercial and industrial establishments. A large portion of the effluent from the secondary units of the plant is utilized by Bethlehem Steel Company's Sparrows Point Plant, while the remainder is discharged to Back River.[1/]

Ultimate disposal of the effluent used by Bethlehem Steel Company is to Bear Creek of the Patapsco River Basin, thus removing this waste from Back River. The trend of effluent use by the Sparrows Point Plant has been to utilize greater quantities, as shown in the following Table.

Year	Total Effluent (MGD)	Effluent Sold to Bethlehem Steel Co.	Effluent to Back River (MGD)
1948	104	32	72
1953	109	53	56
1958	131	85	46
1962	170	110	60
1963	153	113	40

It is anticipated that the Bethlehem Steel Company Plant will continue to use greater quantities of the sewage treatment plant effluent, which may result in decreased discharges to Back River.

The five-day biochemical oxygen demand of the effluent averages about 20 parts per million, with a total suspended solids content of 20 parts per million.7/ Also, the sewage effluent still contains nutrients which could stimulate the growth of algae. Effluent discharged to the river is chlorinated during the recreation season, April through September, to reduce bacterial counts.

Programmed improvements in the Back River Sewage Treatment Plant over the past several years have resulted in improved effluent quality. The plant is presently operating within its capacity of 170 million gallons per day. Planned future development of the treatment facilities will handle the increased load from Baltimore County. The County will share the costs of these developments.

Individual Sewage Disposal Systems

The shores of Back River are lined with private residences, many of which were apparently designed as weekend and summer cottages; however, almost all are inhabited year-round at present. Most of these residences are not served by public sewerage; they utilize septic tanks with seepage pits or drain fields, even though the soil in the area is generally unsuitable for absorption. While these sewage disposal facilities may have been adequate for short-term usage each year, the continuous loading from year-round occupancy has resulted in sewage being discharged to the river by way of ditches, gullies, and storm drains. In addition, waste waters from many residences and several commercial establishments more distant from the river also reach tributaries of Back River after discharge from inadequate septic tank systems.

The number of households with private sewage disposal facilities was about 4,900 at the time of the 1960 census. When in session, the Back River Elementary School discharges about 12,000 gallons per day to a ditch leading to the River from a septic tank and inadequate seepage pit. Also, four large trailer parks discharge sewage to tributary streams, three from septic tanks and inadequate sub-surface disposal, one from a septic tank and sand filter followed by chlorination.

To illustrate difficulties in providing sewage facilities, a major factor is: all sewage projects in Baltimore County must be

self-supporting. The costs for sewerage are apportioned to land owners on a basis of front-footage. Any deficit may be paid over a period of 10 years with interest. Plumbers' fees for sewer connections may also be financed for the owner by the County over a period of 10 years with interest. Within a metropolitan district or a danger-to-health area, designated by a County committee made up of the Chief Sanitary Engineer, The Director of Finance, and the Director of the Section of Environmental Health, all costs may be financed over a period of 40 years with interest. According to preliminary studies by the Baltimore County Department of Public Works, the cost of sewerage to average home owners in now unsewered areas along the shores of Back River may be considerable. Because of present low population densities, the cost of providing sewerage for households in the unsewered areas would probably be prohibitive, unless new methods of financing are developed.

Marinas and Marine Craft

Many of the 837 craft ($7\frac{1}{2}$ or more horsepower) registered as having home ports in the Back River area are equipped with flush toilets. Section 402 of the Maryland State Board of Health and Mental Hygiene Regulations (Appendix II) prohibits discharge of domestic sewage into any watercourse in such a manner to cause pollution or create nuisance. Control of waste discharges from craft docked at marinas is achieved through marine-clientele contracts which prohibit waste discharges at the facility. However, waste discharges

from craft cruising in the River or docked at private docks are presently uncontrolled. Marina locations are indicated on Figure 1.

Industrial Waste-Water

The Eastern Stainless Steel Company discharges an average of about 700,000 gallons per day (1.4 million gallons per day maximum) of waste water to Bacon Creek just above its confluence with Back River, 8.5 miles upstream from the mouth. The plant's sanitary sewage and acid process waters are neutralized with lime (automatically fed) in a baffled lagoon with an average retention time of 4.5 hours. The lagoon allows time for neutralization and for settling of iron oxide and other sediment. Cooling water is also discharged to this lagoon and oil is removed by means of an Earle Surface-Separator System. The Maryland Water Pollution Control Commission frequently inspects this operation and has observed effluent pH values as low as 2.8 for short periods of time, generally attributable to equipment failure. It is significant to note that no appreciable effect has been noted on Back River water quality after the pH dropped below the Commission's established limits of 5.5-8.5, even in proximity to the discharge.

Armco Steel Company discharges its sanitary waste to Baltimore City sanitary sewers, with its waste process and cooling water being discharged through City storm sewers to Herring Run, 3.8 miles above the head of the estuary. The rate of waste-water discharge is not metered; however, average water intake to the plant is about 1.5

million gallons per day (3.0 million gallons per day maximum), and the waste-water discharge would probably be in the same range. The acid waste is neutralized, then diluted with cooling water from which waste oil has been skimmed manually and mill scale settled in two settling ponds.

Other industries, which use smaller quantities of water, are located on tributary streams. In addition to the industries which normally discharge waste-water directly to the basin, the many other establishments located on tributaries may influence water quality as a result of spills and other accidents. All sizable industries discharging waste water directly to the Back River Basin are listed in Appendix III.

EFFECTS OF WASTES ON WATER QUALITY AND WATER USE

Studies by Baltimore County Department of Health

Based upon field observations and occasional bacteriological examinations, the Baltimore County Department of Health has considered Back River north of Eastern Airport to be polluted and unsafe for swimming for about the past 20 years. On July 19, 1963, the Section of Environmental Health of that Department surveyed the bacteriological quality of the Back River estuary at 16 key stations. At each station bacteriological samples were taken above, opposite, and below potential sources of pollution, and one pH analysis was made, except for samples taken at the Back River Sewage Treatment Plant outfall where twice as many samples were taken. The results of the survey, presented in Appendix IV, indicate a "high degree of bacteriological pollution" in the River except for the areas below Evergreen Park and Edgemere. Areas below Evergreen Park and Edgemere also had low bacterial counts in a survey on June 25, 1963.

At each station, the most probable number of coliform bacteria in at least one sample exceeded the Maryland State Department of Health Standards governing water quality for bathing beaches. (Appendix V). The survey report states that the high bacterial counts were caused by "Literally hundreds of over-flowing or malfunctioning septic tanks systems situated primarily along the beach and shore fronts" by "over-flowing septic tanks from inland sources," and by marine craft. This report contains a conclusion that the "only means

by which this situation can be solved is the extension of sewers." The survey also indicated that bacterial counts in the vicinity of the Back River Sewage Treatment Plant outfall were relatively low, as compared with other areas in the river (except for the lower reaches).

Studies by the Baltimore City Department of Public Works

The Baltimore City Department of Public Works has sampled the waters of Back River and the adjacent waters of Chesapeake Bay at 14 stations several times a year for the past several years. Analytical results from the most recent samples taken at seven mid-stream stations are presented in Appendix VI. The results from the most recent sampling of five shoreline stations in the vicinity of the outfall and of the effluent, before and after chlorination, are presented in Appendix VII. The bacteriological analyses at all 14 stations obtained during the past two years are presented in Appendix VIII. The surveys showed the bacterial counts (coliform) to be generally high both at mid-stream and at the shorelines upstream of Muddy Gut, while at Muddy Gut and downstream the counts at mid-stream were generally low. The bacterial counts of the Back River at the sewage treatment plant outfall were generally low, reflecting the effects of chlorination. Shoreline samples usually had higher bacterial counts than mid-stream samples; however, during a few of the surveys, conditions were reversed. The bacterial data are very difficult to interpret because of a lack of knowledge about water

movement in the estuary. The five-day biochemical oxygen demand (20°C.) at the outfall averages about 20 parts per million and decreases to about two parts per million near the Chesapeake Bay. The dissolved oxygen concentrations were high, probably due in part to photosynthesis by algae; however, sampling has not been conducted at night to investigate the possibility of diurnal fluctuations.

For some years the Department has also sampled the various streams as they enter and leave the City. At times increases in biochemical oxygen demand and suspended solids have occurred in Moores Run and Herring Run between entry to and exit from the City, with corresponding decreases in dissolved oxygen; however, the concentrations are not generally severe. The results of the two most recent samplings are presented in Appendix IX.

Studies by the Maryland Water Pollution Control Commission

The Maryland Water Pollution Control Commission has sampled the Back River and Bacon Creek in the vicinity of the Eastern Stainless Steel Company periodically. No adverse conditions caused by industrial waste water have been detected in the past few years. Occasional samples have been taken at various points in the basin in past years in reference to specific complaints, principally concerning oil pollution. A listing of the various pollution conditions observed and investigated by the Commission are reproduced in Appendix X.

Studies by Eastern Stainless Steel Company

The Eastern Stainless Steel Company secured the services of Strassburger & Siegel, Inc., Analytical and Consulting Chemists, to assist in a survey of pH and bacterial counts in Bacon Creek and Back River in the vicinity of their plant. The survey was carried out on November 5, 1963, and the most probable numbers of coliform bacteria per 100 milliliters observed in the waste effluent were 2,800 and 3,500 in two samples. After flowing perhaps 25 yards through a ditch, the number dropped to 210; in Bacon Creek the number was 130; and several yards downstream on Bacon Creek, the number was 79. Counts in Bacon Creek upstream of the plant outfall were high, as were the counts in Back River just upstream of Bacon Creek. These data are summarized in Appendix XI.

REGULATORY AND CO-OPERATING AGENCIES IN WATER QUALITY CONTROL

Cooperation at all levels of government is a matter of necessity in developing optimum water quality control programs for the Back River Basin. This need for cooperation has been recognized, and,over a period of time, legislative actions and administrative agreements have defined the following responsibilities in these programs.

State Board of Health and Mental Hygiene

The State Board of Health exercises primary responsibility with respect to water pollution resulting from untreated or inadequately treated sewage. The Board has jurisdiction over the construction and operation of public sewerage systems, plus private sewage disposal systems and sanitary wastes from industries, which discharge to watercourses or tidewater.

Water Pollution Control Commission

The Commission studies, investigates, and recommends means of preventing pollution of State waters. The Commission exercises primary responsibility with respect to water pollution resulting from discharge of industrial waste, and has established certain standards for industrial waste water discharges and the receiving waters. The above standards are reproduced in Appendix XII.

Baltimore County Board of Health

The County Board of Health has jurisdiction over private sewage disposal systems which do not by design discharge to streams. Since the County Health Officer is also a Deputy State Health Officer, at times the County Board may assist the State Board of Health in its functions, such as the sampling of public water supplies and public or industrial sanitary sewage discharges.

Baltimore County Department of Public Works

This Department is active in the planning, design, inspection, and maintenance of public sewerage as a part of its broad program in public works. The County Department of Public Works cooperates with the State and Federal Government in the inspection and approval of those major interceptor projects which are jointly financed with Federal and State grants for sewage works construction.

Baltimore City Department of Health

Within Baltimore City, the City Department of Health supervises soil percolation tests in the few instances where sanitary sewers do not exist, chiefly for industrial and commercial property. Based on the results of the data, recommendations on the type and size of individual disposal systems are submitted to the Bureau of Building Inspectors and are used as a basis for approval.

Baltimore City Department of Public Works

This Department is responsible for public sewerage in the City and operates the City's Back River Sewage treatment plant, as discussed previously. The plant serves all of the sewered areas in the Back River Basin in addition to areas in metropolitan Baltimore.

Maryland State Planning Department

In addition to its normal responsibility in coordinating long-range planning programs which affect the State, the Planning Department is sponsoring the Maryland Water Supply and Requirements Study. Through cooperation with several Federal and State agencies, the staff and several consultants are preparing a complete inventory of water resources and water uses, and are making projections of future needs.

Chesapeake Bay Institute, The Johns Hopkins University

The Institute at Johns Hopkins University studies the chemical, physical, and biological characteristics of the Chesapeake Bay and its estuaries. As a part of its over-all program, salinity, tides, and other factors have been studied in Back River. The rates of exchange for several tributary estuaries of the upper Bay are being determined under a contract with the State Department of Health. To date, the Severn, Magothy, Gunpowder and Susquehanna Rivers, as well as the Baltimore Harbor system, have been examined with tracer releases.

BIBLIOGRAPHY

1. Maryland State Planning Department, Maryland Water Supply and Requirements Study, "Distances from Mouth of Waterway and Drainage Areas for Specific Locations," Baltimore, 1963 (Mimeographed).

2. U. S. Public Health Service, Department of Health, Education and Welfare, "Prospectus, Comprehensive Water Quality Project, Chesapeake Bay-Susquehanna River Basins," Charlottesville, Virginia, August, 1962 (Mimeographed).

3. U. S. Coast and Geodetic Survey, Department of Commerce, Map.

4. Chesapeake Bay Institute, The Johns Hopkins University, personal communication with Donald Pritchard, Director, December 3, 1963.

5. Maryland State Department of Geology, Mines and Water Resources, and Geological Survey, U. S. Department of the Interior, Maryland Streamflow Characteristics, Flood Frequency, Low Flow Frequency, and Flow Duration, Bulletin 25 (prepared by John M. Darling), Baltimore 1963.

6. Baltimore County Department of Health, "Physical and Bacteriological Survey of Back River," Towson, Maryland, August 13, 1963 (Mimeographed).

7. Keefer, C. E., "Improvements and Operation at Baltimore's Back River Sewage Works," Journal, Water Pollution Control Federation, Vol. 33, No. 1, January, 1961.

8. Baltimore City Department of Public Works, Bureau of Sewers, "1962 Annual Report," Baltimore, 1962.

9. Annotated Code of Maryland, 1957.

   Baltimore County Code, 1958.

   Baltimore County Office of Planning and Zoning, "Pollution Control and the Development of Port-Served Industry with Particular Reference to the Back River Area," Towson, Maryland, 1960 (Mimeographed).

   Baltimore Regional Planning Council, Maryland State Planning Department, "A Regional Data System Summary," Technical Report No. 6, Baltimore, November 1960 (Mimeographed).

Baltimore Regional Planning Council, Maryland State Planning Department, "Population and Housing Statistics," Statistical Bulletin No. 1, Baltimore, August 1960 (Mimeographed).

Baltimore Regional Planning Council, Maryland State Planning Department, "Water Supply and Sewerage," Technical Report No. 4, Baltimore, May 1959 (Mimeographed).

Baltimore County Department of Recreation and Parks and Office of Planning and Zoning, "Waterfront Recreation Survey," Towson, Maryland, November 1959 (Mimeographed).

Chaney, Charles C., Marinas, Recommendations for Design Construction and Maintenance, National Association of Engine and Boat Manufacturers, Inc., New York, 1961.

Water Resources Commission of Maryland, Report Setting Forth Recommendations as to Policy, Legislation and Methods of Financing for the Preservation of The Water Supply Resources of the State of Maryland, Baltimore, January 1933.

Whitman, Requardt and Associates, "Report to Baltimore County Department of Public Works on the Back River Neck Peninsula Sewerage System," Baltimore, January 1958 (Mimeographed).

APPENDIX I

Sewage Pumping Stations in the Back River Basin

Name of Pumping Station	Location of Pumping Station	Stream Receiving Overflow	Capacity (gallons per min.)	Number of Dwellings Served
I. Baltimore City				
Panitz #1	Bowley's Lane	Moores Run	1800	600
Panitz #2	Radecke Avenue	Moores Run	1450	1800
Frankford Gardens	Force Road	Moores Run	2000	1000
Dobson	Seward Avenue	Moores Run	66	74
Welsh	Denview Way	Moores Run	1800	2500
II. Baltimore County				
East Point	Oak Avenue	Bacon Creek		
Essex	Riverside Drive	Back River		
S. Marylyn Avenue	S. Marylyn Avenue	Back River		
Duck Cove	Riverside Drive	Duck Creek		
N. Point Drive	N. Point Blvd.	Bread and Cheese Creek		
Rosedale	Philadelphia Rd.	Moores Run		
Stemmers Run	Mace Avenue	Stemmers Run		
Edgemere	Lynch Point	Back River		

APPENDIX II

Maryland State Board of Health and Mental Hygiene Regulations on Discharge of Domestic Sewage in a Watercourse, Section 4.02

By authority conferred by Section 2 of Article 43 of the Annotated Code of Maryland ..."All domestic sewage shall be disposed of by an approved method of collection, treatment and effluent discharge. Domestic sewage or sewage effluent shall not be disposed of in any manner that will cause pollution of the ground surface, ground water, bathing area, lake, pond, watercourse, or tidewater, or create a nuisance. It shall not be discharged into any abandoned or unused well, or into any crevice, sink hole, or other opening either natural or artificial in a rock formation. Specific approval may be obtained from the approving authority, under unusual conditions, to discharge sand filter chlorinated effluent into a watercourse."

APPENDIX III

Industries Discharging Waste Water Directly to the Back River Basin

Name of Industry	Waste-Water Discharge (million gallons per day)	Receiving Stream	Miles Above Mouth of Stream Listed	Miles Above Mouth of Back River
Friez Instrument Div., Bendix Corp.	Unknown	Herring Run	9.9	19.1
American Totalisator Company, Division of Universal Controls, Inc.		Herring Run	9.9	19.1
Continental Can Co., Plant #16		Trib. of Herring Run	1.1	13.2
Continental Can Co., Plant #79		Trib. of Herring Run	1.0	13.1
Armco Steel Co.	Unknown	Trib. of Herring Run	0.9	13.0
Trailmobile, Inc.		Moores Run	0.5	10.7
Kennedy Mfg. Co.		Redhouse Creek	0.8	10.1
Champion Brick Co.		Redhouse Creek	0.4	9.7
Perfection Laundry		Stemmers Run	1.0	10.3
Eastern Stainless Steel Co.	0.70	Bacon Creek	0.1	8.5
Essex Hy-Grade Laundry I		Trib. of Deep Creek	1.5	8.0

APPENDIX IV

Bacteriological and pH Study of Back River
by the
Baltimore County Department of Health, July 19, 1963

SAMPLING STATION	COLIFORM CONTENT	ESCHERICHA COLI	pH
Denbows	4,600	3.6	8 plus
	930	21	
	24,000	23	
Easton Boat Yard	11,000	9.1	8 plus
	2,400	9.1	
	930	15	
Lynhurst	230	43	8
	4,600	430	
	24,000 plus	930	
Bletzer Road	24,000 plus	2,400	8
	24,000 plus	11,000	
	4,600	930	
Sewage Plant At Outfall	4,600	150	8 plus
	390	230	
	4,600	390	
Sewage Plant At Outfall	930	430	8 plus
	1,500	230	
	430	43	
North of Eastern Stainless Steel	24,000 plus	24,000 plus	7
	24,000 plus	24,000 plus	
	24,000 plus	24,000 plus	
Near Balto. County Pumping Station	4,600	430	8 plus
	24,000	430	
	11,000	150	
Ken's Marina	4,600	930	8 plus
	24,000	2,400	
	4,600	930	
Cox Point Near Marylyn Avenue	11,000	11,000	8 plus
	11,000	930	
	4,600	930	

APPENDIX IV (Cont'd)

Cox Point	11,000	430	7 plus
	11,000	430	
	11,000	430	
Hyde Park	24,000	4,600	8 plus
	4,600	930	
	2,400	930	
Eastern Airport	4,600	2,400	8 plus
	4,600	4,600	
	2,400	2,400	
Evergreen Park	2,400	93	8 plus
	430	23	
	230	93	
Wildwood	230	43	8
	930	9.1	
	93	23	
Cedar Point	230	43	8 plus
	930	230	
	930	230	

APPENDIX V

Regulations Governing Public Swimming Pools and Bathing Beaches, State Board of Health of Maryland, Regulation 7, Sanitary Quality of Water, etc. (part)

Under authority conferred by Section 2 of Article 43 of the Annotated Code of Maryland . . .

The bacterial quality of water of natural bathing beaches is acceptable when the water shows an average "most probable number" (MPN) of coliform bacteria not in excess of 1,000 per 100 milliliters in any one month during the bathing season, provided a sanitary survey discloses no immediate danger from harmful pollution. The presence of such pollution shall be determined from the findings of sanitary surveys made by the State Board of Health.

The right is reserved to close any swimming pool or bathing beach because of continued failure to meet the above standards.

APPENDIX VI

Analyses of Back River and Chesapeake Bay Waters
Baltimore City Department of Public Works, August 22, 1963

Station Number	Location	Coliform Bacteria (MPN/100 ml)	B.O.D. 5-day, 20°C. (p.p.m.)	Dissolved Oxygen (p.p.m.)	Chlorides (p.p.m.)	pH
1	Island Point	23,000	7	9.7	450	7.24
1A	At Discharge	7.2	20	5.7	730	7.10
1B	Deep Creek	23,000	9	13.3	1270	8.83
2	Muddy Gut	930	4	14.9	1940	9.19
3	Porter's Bar	43	5	13.9	2460	9.11
4	Clay Bank	23	4	9.8	3540	8.37
5	Rocky Point	-3	4	9.7	3660	7.64
6	Brown's Thorofare	3	2	8.8	3370	7.53
7	Miller's Island	3.6	4	8.8	3450	7.23

(All samples were taken at high tide)

APPENDIX VII

Analyses of Shoreline Waters of Back River in the Vicinity of Back River Sewage Treatment Plant, Baltimore City Department of Public Works, September 18, 1963

Station Number	Location	Coliform Bacteria (MPN/100 ml)	B.O.D. 5-day 20°C. (P.P.M.)	Dissolved Oxygen (P.P.M.)	Turbidity (P.P.M.)	pH
1	Island Point Shoreline	43,000	12	13.0	230	8.66
2	South of West End of Bridge	23,000	4	11.2	185	8.81
4	South of East End of Bridge	93,000	5	9.6	220	8.47
5	East Shore - 1 mile South of Bridge	2,300	3	9.9	200	8.89
7	East Shore - North of Deep Creek	2,300	4	11.7	205	8.89
Effluent	Spillway (before chlorination)	9,300,000	29	2.7	---	---
Effluent	Terminal Chamber (after chlorination)*	24,000	43	8.9	---	---

* Some additional contact time exists after this point for chlorine reaction.

APPENDIX VIII

Bacteriological Analyses of Back River, Chesapeake Bay, and Back River Sewage Treatment Plant Effluent, Baltimore City Department of Public Works

Designation for this Report	Station Number	Location	Coliform Bacteria (MPN/100 ml)	
			May 7, 1962 May 14, 1962 May 21, 1962	May 28, 1962 June 4, 1962 June 7, 1963
a	2	South of West End of Bridge	15,000 23,000 1,500	93,000 9,300 --
b	4	South of East End of Bridge	9,300 9,300 150,000	4,300 23,000 --
c	1	Island Point (Mid-stream)	-- -- --	-- -- 430
d	1	Island Point Shoreline	24,000 150,000 93,000	4,300 2,300 --
e	5	East Shore - 1 mile South of Bridge	1,500 43,000 43,000	23,000 23,000 --
f	Effluent	Spillway	4,300,000 430,000 9,300,000	2,300,000 930,000 --
g	Effluent	Terminal Chamber	430,000 930,000 93	43 4,300 --
h	Effluent	Terminal Chamber	2,300,000 4,300,000 4,300	93,000 93,000 --
i	1A	Back River at Effluent Discharge	-- -- --	-- -- 230
j	7	East Shore North of Deep Creek	43,000 7,500 43,000	23,000 43,000 --

APPENDIX VIII (Con't.)

Designation for this Report	Coliform Bacteria (MPN/100 ml)			
	June 11, 1962 June 18, 1962 June 25, 1962	July 2, 1962 July 9, 1962 July 16, 1962	July 23, 1962 July 30, 1962 Aug. 6, 1962	Aug.13, 1962 Aug.16, 1962 Aug.21, 1962
a	2,300 430 23,000	2,300 230 430	2,300 230 4,300	2,300 -- 430
b	23,000 9,300 43,000	9,300 930 23,000	4,300 4,300 2,300	2,300 -- 430
c	-- -- --	-- -- --	-- -- --	-- 430 --
d	2,300 4,300 23,000	4,300 430 4,300	2,300 230 23,000	2,300 -- 360
e	2,300 430 930	930 430 4,300	230 4,300 430	2,300 -- 230
f	2,300,000 2,300,000 430,000	230,000 2,300,000 4,300,000	4,300,000 2,300,000 2,300,000	430,000 -- 2,300,000
g	930 43 23,000	23 23 0	43 23 2,300	9,300 -- 0
h	4,300 4,300 230,000	430 920 930	4,300 9,300 4,300	230 -- 430
i	-- -- --	-- -- --	-- -- --	-- -- --
j	2,300 9,300 23,000	4,000 230 23,000	430 9,300 4,300	4,300 -- 4,300

APPENDIX VIII (Con't.)

Designation for this Report	Coliform Bacteria (MPN/100 ml)			
	Aug. 27, 1962 Sept. 4, 1962 Sept.10, 1962	Sept. 18, 1962 Sept. 21, 1962 May 20, 1963	May 27,1963 June 17,1963 June 20,1963	June 24, 1963 July 1, 1963 July 8, 1963
a	62 24,000 230	23,000 — 93	230 430 —	930 46,000 4,300
b	430 430 430	93,000 — 93	430 430 —	230 2,300 9,300
c	— 9,300 —	— 4,300 —	— — 430	— — —
d	2,300 9,300 4,300	43,000 — 43	2,300 930 —	9,300 430 46,000
e	230 930 2,300	2,300 — 43	430 430 —	930 4,300 24,000
f	23,000,000 23,000,000 24,000,000	9,300,000 — 11,000,000	2,300,000 2,300,000 —	2,300,000 9,300,000 9,300,000
g	430 93 430	24,000 — 2,400	120 110,000 —	30 23 23
h	2,300 430 —	— — 11,000	930 110,000 —	930 4,300 750
i	— — —	— 4,300 —	— — 230	— — —
j	2,300 930 4,300	2,300 — 150	930 2,300 —	15,000 2,300 24,000

APPENDIX VIII (Con't.)

Designation for this Report	Coliform Bacteria (MPN/100 ml)			
	July 15, 1963 July 18, 1963 July 22, 1963	July 29, 1963 Aug. 5, 1963 Aug. 12, 1963	Aug. 19, 1963 Aug. 22, 1963 Sept. 3, 1963	Sept. 9, 1963 Sept. 16, 1963
a	110,000 — 150	230 9,300 2,300	930 — 930	3,900 24,000
b	110,000 — 4,300	4,300 24,000 930	2,300 — 4,300	430 110,000
c	— 2,000 —	— — —	— 23,000 —	— —
d	24,000 — 4,300	4,300 24,000 4,300	930 — —	— —
e	430 — 2,300	2,300 2,300 930	750 — —	930 46,000
f	1,500,000 — 1,500,000	9,300,000 24,000,000 24,000,000	24,000,000 — —	24,000,000 110,000,000
g	230 — 23	-3 430 -3	3.6 — —	9,300 23
h	46,000 — 4,300	230 15,000 150	— 9,300 —	4,300 230
i	— 110,000 —	— — —	— — 7.2	— —
j	4,300 — 24,000	9,300 43,000 430	4,300 — 2,300	930 24,000

APPENDIX VIII (Con't.)

Designation for this Report	Station Number	Location	Coliform Bacteria (MPN/100 ml)	
			June 7, 1963 Aug. 16, 1963 Sept. 21, 1963	June 20, 1963 July 18, 1963 Aug. 22, 1963
k	1B	At Deep Ck.	230	4,300
		(Mid-stream	2,300	110,000
		of Back	4,300	23,000
		River)		
l	2	Muddy Gut	230	230
		(Mid-stream	15	230
		of Back	230	950
		River)		
m	3	Porter's Bar	43	23
		(Mid-stream	23	43
		of Back	230	43
		River)		
n	4	Clay Bank	43	230
		(Mid-stream	150	23
		of Back	43	23
		River)		
o	5	Rocky Point	93	2,100
		(Mid-stream	23	930
		of Back	93	-3
		River)		
p	6	Brown's Thorofare	23	430
		(Mid-stream	3.6	430
		of Back	43	3
		River)		
q	7	Miller's Island	23	43
		Chesapeake Bay	20	93
			--	3.6

APPENDIX IX

Stream Sampling Results by Baltimore City Department of Public Works for Herring Run and Moores Run

Stream	Sampling Station Location	5-Day B.O.D. (p.p.m.)	Dissolved Oxygen (p.p.m.)	Suspended Solids (p.p.m.)	pH	Water Temp. (°F.)
		July 25, 1963				
Moores Run	Entry to City	8	8.3	10	7.44	79
Moores Run	Exit from City	16	5.5	19	7.44	75
W. Br. Herring Run	Entry to City	10	10.7	11	7.90	79
E. Br. Herring Run	Entry to City	12	10.8	14	7.88	79
*Chinquapin Run	Entry to City	10	9.6	11	8.21	72
Herring Run	Exit from City	20	7.0	23	7.16	79
		October 10, 1963				
Moores Run	Entry to City	4	7.1	6	7.26	66
Moores Run	Exit from City	21	1.8	14	6.78	68
W. Br. Herring Run	Entry to City	5	10.9	7	7.62	61
E. Br. Herring Run	Entry to City	6	13.2	8	7.79	57
*Chinquapin Run	Entry to City	3	10.7	4	7.28	54
Herring	Exit from City	17	4.7	13	6.98	61

* Tributary of Herring Run

APPENDIX VI

Analyses of Back River and Chesapeake Bay Waters
Baltimore City Department of Public Works, August 22, 1963

Station Number	Location	Coliform Bacteria (MPN/100 ml)	B.O.D. 5-day, 20°C. (p.p.m.)	Dissolved Oxygen (p.p.m.)	Chlorides (p.p.m.)	pH
1	Island Point	23,000	7	9.7	450	7.24
1A	At Discharge	7.2	20	5.7	730	7.10
1B	Deep Creek	23,000	9	13.3	1270	8.83
2	Muddy Gut	930	4	14.9	1940	9.19
3	Porter's Bar	43	5	13.9	2460	9.11
4	Clay Bank	23	4	9.8	3540	8.37
5	Rocky Point	-3	4	9.7	3660	7.64
6	Brown's Thorofare	3	2	8.8	3370	7.53
7	Miller's Island	3.6	4	8.8	3450	7.23

(All samples were taken at high tide)

APPENDIX VII

Analyses of Shoreline Waters of Back River in the Vicinity of Back River Sewage Treatment Plant, Baltimore City Department of Public Works, September 18, 1963

Station Number	Location	Coliform Bacteria (MPN/100 ml)	B.O.D. 5-day 20°C. (P.P.M.)	Dissolved Oxygen (P.P.M.)	Turbidity (P.P.M.)	pH
1	Island Point Shoreline	43,000	12	13.0	230	8.66
2	South of West End of Bridge	23,000	4	11.2	185	8.81
4	South of East End of Bridge	93,000	5	9.6	220	8.47
5	East Shore - 1 mile South of Bridge	2,300	3	9.9	200	8.89
7	East Shore - North of Deep Creek	2,300	4	11.7	205	8.89
Effluent	Spillway (before chlorination)	9,300,000	29	2.7	---	---
Effluent	Terminal Chamber (after chlorination)*	24,000	43	8.9	---	---

* Some additional contact time exists after this point for chlorine reaction.

APPENDIX VIII

Bacteriological Analyses of Back River, Chesapeake Bay, and Back River Sewage Treatment Plant Effluent, Baltimore City Department of Public Works

Designation for this Report	Station Number	Location	Coliform Bacteria (MPN/100 ml)	
			May 7, 1962 May 14, 1962 May 21, 1962	May 28, 1962 June 4, 1962 June 7, 1963
a	2	South of West End of Bridge	15,000 23,000 1,500	93,000 9,300 --
b	4	South of East End of Bridge	9,300 9,300 150,000	4,300 23,000 --
c	1	Island Point (Mid-stream)	-- -- --	-- -- 430
d	1	Island Point Shoreline	24,000 150,000 93,000	4,300 2,300 --
e	5	East Shore - 1 mile South of Bridge	1,500 43,000 43,000	23,000 23,000 --
f	Effluent	Spillway	4,300,000 430,000 9,300,000	2,300,000 930,000 --
g	Effluent	Terminal Chamber	430,000 930,000 93	43 4,300 --
h	Effluent	Terminal Chamber	2,300,000 4,300,000 4,300	93,000 93,000 --
i	1A	Back River at Effluent Discharge	-- -- --	-- -- 230
j	7	East Shore North of Deep Creek	43,000 7,500 43,000	23,000 43,000 --

APPENDIX VIII (Con't.)

Designation for this Report	Coliform Bacteria (MPN/100 ml)			
	June 11, 1962 June 18, 1962 June 25, 1962	July 2, 1962 July 9, 1962 July 16, 1962	July 23, 1962 July 30, 1962 Aug. 6, 1962	Aug.13, 1962 Aug.16, 1962 Aug.21, 1962
a	2,300 430 23,000	2,300 230 430	2,300 230 4,300	2,300 -- 430
b	23,000 9,300 43,000	9,300 930 23,000	4,300 4,300 2,300	2,300 -- 430
c	-- -- --	-- -- --	-- -- --	-- 430 --
d	2,300 4,300 23,000	4,300 430 4,300	2,300 230 23,000	2,300 -- 360
e	2,300 430 930	930 430 4,300	230 4,300 430	2,300 -- 230
f	2,300,000 2,300,000 430,000	230,000 2,300,000 4,300,000	4,300,000 2,300,000 2,300,000	430,000 -- 2,300,000
g	930 43 23,000	23 23 0	43 23 2,300	9,300 -- 0
h	4,300 4,300 230,000	430 920 930	4,300 9,300 4,300	230 -- 430
i	-- -- --	-- -- --	-- -- --	-- -- --
j	2,300 9,300 23,000	4,000 230 23,000	430 9,300 4,300	4,300 -- 4,300

APPENDIX VIII (Con't.)

Designation for this Report	Coliform Bacteria (MPN/100 ml)			
	Aug. 27, 1962	Sept. 18, 1962	May 27,1963	June 24, 1963
	Sept. 4, 1962	Sept. 21, 1962	June 17,1963	July 1, 1963
	Sept.10, 1962	May 20, 1963	June 20,1963	July 8, 1963
a	62	23,000	230	930
	24,000	—	430	46,000
	230	93	—	4,300
b	430	93,000	430	230
	430	—	430	2,300
	430	93	—	9,300
c	—	—	—	—
	9,300	4,300	—	—
	—	—	430	—
d	2,300	43,000	2,300	9,300
	9,300	—	930	430
	4,300	43	—	46,000
e	230	2,300	430	930
	930	—	430	4,300
	2,300	43	—	24,000
f	23,000,000	9,300,000	2,300,000	2,300,000
	23,000,000	—	2,300,000	9,300,000
	24,000,000	11,000,000	—	9,300,000
g	430	24,000	120	30
	93	—	110,000	23
	430	2,400	—	23
h	2,300	—	930	930
	430	—	110,000	4,300
	—	11,000	—	750
i	—	—	—	—
	—	4,300	—	—
	—	—	230	—
j	2,300	2,300	930	15,000
	930	—	2,300	2,300
	4,300	150	—	24,000

APPENDIX VIII (Con't.)

Designation for this Report	Coliform Bacteria (MPN/100 ml)			
	July 15, 1963 July 18, 1963 July 22, 1963	July 29, 1963 Aug. 5, 1963 Aug. 12, 1963	Aug. 19, 1963 Aug. 22, 1963 Sept. 3, 1963	Sept. 9, 1963 Sept. 16, 1963
a	110,000 — 150	230 9,300 2,300	930 — 930	3,900 24,000
b	110,000 — 4,300	4,300 24,000 930	2,300 — 4,300	430 110,000
c	— 2,000 —	— — —	— 23,000 —	— —
d	24,000 — 4,300	4,300 24,000 4,300	930 — —	— —
e	430 — 2,300	2,300 2,300 930	750 — —	930 46,000
f	1,500,000 — 1,500,000	9,300,000 24,000,000 24,000,000	24,000,000 — —	24,000,000 110,000,000
g	230 — 23	-3 430 -3	3.6 — —	9,300 23
h	46,000 — 4,300	230 15,000 150	— 9,300 —	4,300 230
i	— 110,000 —	— — —	— — 7.2	— —
j	4,300 — 24,000	9,300 43,000 430	4,300 — 2,300	930 24,000

APPENDIX VIII (Con't.)

Designation for this Report	Station Number	Location	Coliform Bacteria (MPN/100 ml)	
			June 7, 1963 Aug. 16, 1963 Sept.21, 1963	June 20, 1963 July 18, 1963 Aug. 22, 1963
k	1B	At Deep Ck. (Mid-stream of Back River)	230 2,300 4,300	4,300 110,000 23,000
l	2	Muddy Gut (Mid-stream of Back River)	230 15 230	230 230 950
m	3	Porter's Bar (Mid-stream of Back River)	43 23 230	23 43 43
n	4	Clay Bank (Mid-stream of Back River)	43 150 43	230 23 23
o	5	Rocky Point (Mid-stream of Back River)	93 23 93	2,100 930 -3
p	6	Brown's Thorofare (Mid-stream of Back River)	23 3.6 43	430 430 3
q	7	Miller's Island Chesapeake Bay	23 20 --	43 93 3.6

APPENDIX IX

Stream Sampling Results by Baltimore City Department of Public Works for Herring Run and Moores Run

Stream	Sampling Station Location	5-Day B.O.D. (p.p.m.)	Dissolved Oxygen (p.p.m.)	Suspended Solids (p.p.m.)	pH	Water Temp. (°F.)
		July 25, 1963				
Moores Run	Entry to City	8	8.3	10	7.44	79
Moores Run	Exit from City	16	5.5	19	7.44	75
W. Br. Herring Run	Entry to City	10	10.7	11	7.90	79
E. Br. Herring Run	Entry to City	12	10.8	14	7.88	79
*Chinquapin Run	Entry to City	10	9.6	11	8.21	72
Herring Run	Exit from City	20	7.0	23	7.16	79
		October 10, 1963				
Moores Run	Entry to City	4	7.1	6	7.26	66
Moores Run	Exit from City	21	1.8	14	6.78	68
W. Br. Herring Run	Entry to City	5	10.9	7	7.62	61
E. Br. Herring Run	Entry to City	6	13.2	8	7.79	57
*Chinquapin Run	Entry to City	3	10.7	4	7.28	54
Herring	Exit from City	17	4.7	13	6.98	61

* Tributary of Herring Run

APPENDIX X

OBSERVATIONS OF WATER POLLUTION CONDITIONS
IN THE BACK RIVER DRAINAGE BASIN.*

(Report by the Maryland Water Pollution Control Commission)

These may be listed and described briefly as follows:

(1) Oil

(2) Petroleum Products Other Than Oil

(3) Trash and Debris

(4) Fish Mortalities

(5) Algal Blooms

(6) Pollen Grain Slicks

1. Oil: This pollutant, not infrequently involving heavy black fuel oil, has been observed and traced to a variety of sources. Oil pollution in the Back River Drainage Basin has resulted from spillages during delivery of clean fuel oil, accidental rupturing of pipelines, the flushing down of roadways by fire department personnel following vehicular accidents, improper disposal of waste oil by scavengers, losses from gasoline service stations, leakages from waste oil disposal areas, and losses and spills from industrial operation. Generally, it has been possible--through stern action and continued surveillance--to control oil pollution resulting from fixed sources. There is no way,

---

* Since the Maryland Water Pollution Control Commission has jurisdiction only over other-than-health aspects of pollution, and therefore deals in the main with industrial wastes, this description does not include references to water pollution involving sanitary sewage effect on swimming, the public health, or the sanitary quality of the water.

of course, of guaranteeing that oil pollution can be controlled when caused by transient sources entering the storm water drainage system of the Back River Drainage Area.

2. Petroleum Products Other Than Oil: There have been several instances where gasoline and kerosene have spilled into tributaries of Back River. Except where such pollution results from transient sources, the operations responsible can be--and have been--controlled.

3. Trash and Debris: These contaminating materials are derived from two principal sources: Deposits into streams and storm drains throughout the entire drainage basin, and improper operation of dumps and refuse disposal areas. Removal of the objectionable matter and adequate control procedures are required by the Commission wherever the source of the problem can be identified.

4. Fish Mortalities: Years ago, complaints about fish mortalities and observation of fish mortalities were not uncommon during the summer months. These occurrences were attributed to a combination of elevated temperatures and the depletion of dissolved oxygen caused by heavy algal blooms and the consequent diurnal oxygen-carbon dioxide fluctuations. More recently, since the majority of treated sewage from the Back River Sewage Treatment Plant has been transported outside the Back River estuary, the oxygen-carbon dioxide stresses have not occurred, and there have not been any significant fish mortalities in these waters.

5. Algal Blooms: These are natural conditions, growths of aquatic life, which occur in Back River and in other waters of the State depending upon ambient temperatures and the concentration of nutrients in the water. There is no evidence that algal blooms in Maryland are toxic per se, though it is possible that heavy blooms can produce oxygen-carbon dioxide stresses which may kill fish.

6. Pollen Grain Slicks: Periodically, in the Back River estuary, as in other waters of the State, observations are made of (and complaints received on) slicks or scums of fine, yellow matter often referred to by the public as "sulfur on the water." Under microscopic examination, the accumulation and concentration of yellow matter has been identified as pollen grains. Although these slicks are unsightly, they are entirely natural in origin and not harmful.

APPENDIX XI

Survey of Bacon Creek by Eastern Stainless Steel Company, November 5, 1963

Sampling Station Number	Sampling Station Location	Coliform Bacteria (MPN/100 ml)	E Coli (MPN/100 ml)	Standard Plate Count	pH
1	Plant Effluent	2,800	2,800	42	5.0
1	Plant Effluent	3,500	3,500	135	5.0
2	Effluent Ditch	210	31	1,400	4.8
3	Middle, Bacon Creek opp. plant effluent	130	13	650	5.8
4	E. Bank, Bacon Creek opp. plant effluent	70	70	500	4.5
5	Bacon Creek, 25 yds. upstream of effluent	110	110	4,000	8.0
6	Bacon Creek, 40 yds. upstream of effluent	1,100	700	2,000	7.6
7	Bacon Creek, 65 yds. upstream of effluent	240	240	2,600	7.7
8	Bacon Creek, near headwaters	2,400	2,400	3,200	7.5
9	Bacon Creek, 25 yds. downstream from effluent	79	17	2,000	6.3
10	Bacon Creek at Back River	170	49	1,300	6.8
11	Back River, 75 yds. upstream of Bacon Creek	9,200	1,400	4,500	4.8

Bacon Creek flows north to Back River and is influenced by tides in its lower reaches.

APPENDIX XII

Regulations IV, Treatment and Disposal of Industrial Wastes, of the Maryland Water Pollution Control Commission

No industrial wastes shall be placed or permitted to be placed or discharged or permitted to flow into any of the waters of the State in any manner by any person unless the industrial wastes after treatment or untreated shall meet with the nine industrial waste requirements established by the Water Pollution Control Commission before being discharged into any waters of the State. These nine industrial waste requirements are as follows:

1. Solids:
   - A. Solids in the effluent -- Must not exceed particle size that can pass Tyler designation 20 mesh screen. Grinding, maceration or any other waste treatment or handling operation intended to reduce the size of oversize solids in the effluent to pass Tyler designation 20 mesh screen, will not be permitted or approved.
   - B. Total suspended solids -- Must not exceed 400 ppm.
   - C. Dissolved solids -- Must not exceed 1500 ppm.
   - D. Total solids -- Must not exceed 1900 ppm.
2. Turbidity -- Must transmit 10% of light through 12 inches of sample in a 3 inch column or not to exceed 300 ppm., as determined by the Jackson candle turbidimeter.
3. Biochemical Oxygen Demand:
   - A. The Biochemical Oxygen Demand -- The 5-day, 20°C. Biochemical Oxygen Demand in the effluent must not exceed 100 ppm.
   - B. The Dissolved Oxygen in the waste receiving waters must not be depleted beyond 50% of normal saturation.
4. Toxicity or Toxic compounds -- Eliminate, or reduce to limits of tolerance, substances toxic to humans, livestock, fish, aquatic and wildlife.

APPENDIX XII (Con't.)

5. Color — Color intensity regardless of light frequency must not exceed 400 ppm. on the chloroplatinate scale.

6. pH — Must not range below 5.5 or above 8.5.

7. Temperature — Must be below 100°F. in the stream within 50 feet from waste outlet.

8. Oils and grease in the effluent — Must not exceed 30 ppm.

9. Taste and odor — Effluent must not exceed threshold odor number of 1000. Mixture of the waste and receiving waters shall have a threshold odor number not in excess of 80.

All analyses to be conducted in accordance with the American Public Health Association Standard Methods.

These nine industrial waste requirements are generally applicable values, but are not absolutely fixed values. They can be made more stringent if a survey of the waste receiving waters indicates they are still polluted or are continuing to be degraded, or in any instance where the Water Pollution Control Commission, after due study and deliberation, deems that more stringent requirements are necessary. They can be made more liberal only by formal action of the Commission on the basis of satisfactory evidence and proof that waste receiving waters are sufficient in quantity and quality to not be affected adversely by a particular industrial waste effluent having values in excess of those stated above.

Any industrial wastes, after treatment or untreated, which do not meet with the above requirements shall be deemed and considered in violation of this Regulation based on the Water Pollution Control

Law (Sections 34-45, Article 66C, Annotated Code of Maryland (1957 Edition)), and shall be subjected to penalties imposed thereby. Each day upon which a violation occurs under this Regulation shall be deemed a separate and additional violation.

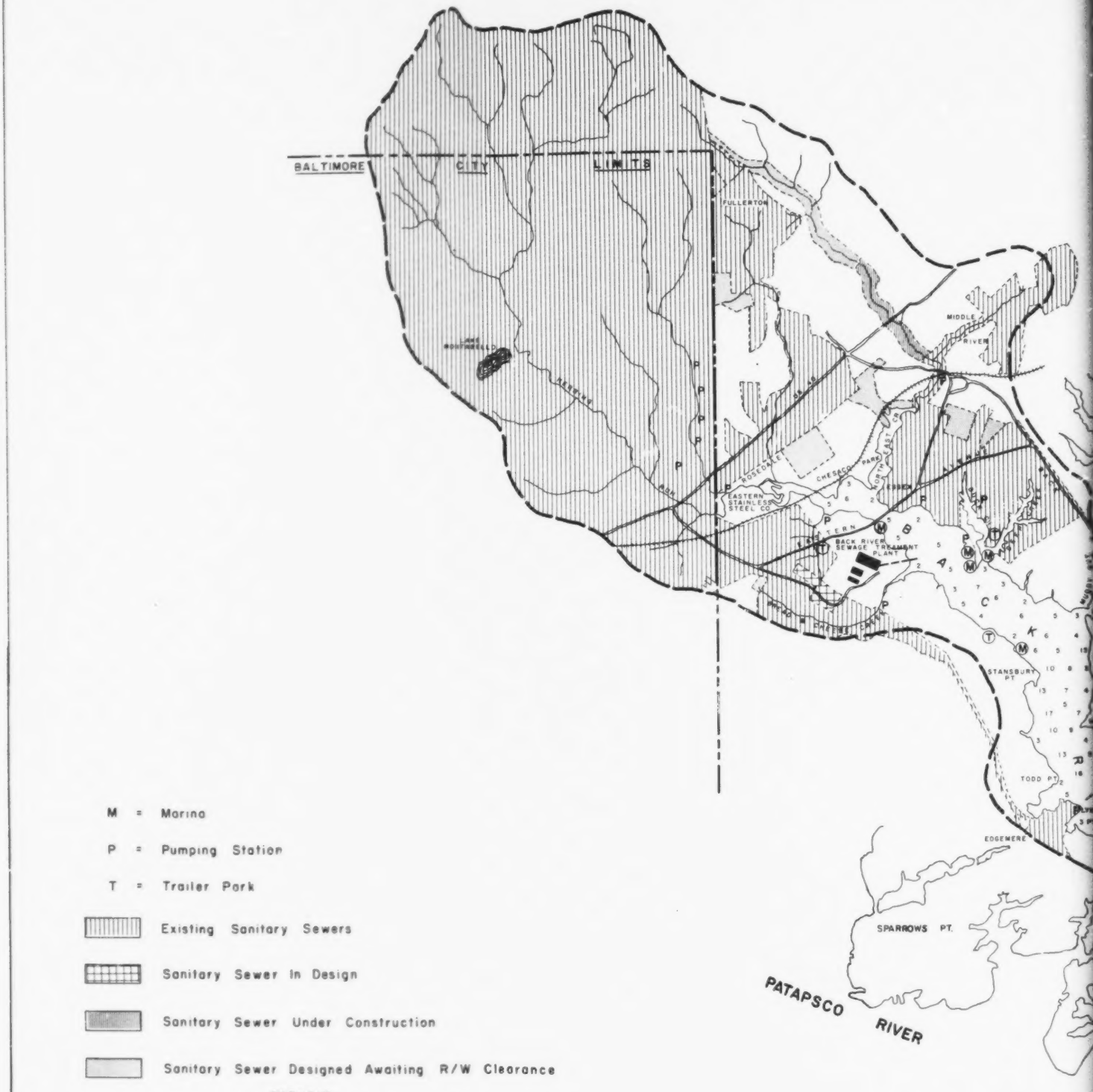

Figure 1, BACK RIVER DRAINAGE BASI

Figure 1, BACK RIVER DRAINAGE BASIN